

National Airspace Redesign Strategic Management Plan

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Executive Summary

The Strategic Management Plan (SMP) for National Airspace Redesign is a single document which defines the program, outlines its goals, and establishes the structure and process necessary to achieve those goals. The SMP is an essential reference source for individuals and teams working on National Airspace Redesign efforts and for individuals and teams working on other NAS modernization programs or concepts.

The National Airspace Redesign, along with other established programs, supports FAA goals. Since all programs work in concert to achieve these higher level goals, the SMP acknowledges that National Airspace Redesign goals and objectives may require modification to conform to other program needs in attaining these higher level goals. Likewise, the SMP recognizes that other program goals may be adjusted to work in concert with National Airspace Redesign.

The SMP recognizes that a composite of local and regional airspace projects will not, by themselves, develop into a cohesive, national system. Therefore, it identifies roles, responsibilities, and processes in a manner designed to break airspace redesign into clear, manageable tasks. It puts mechanisms in place that incorporate individual projects into a national system. The SMP does this by defining responsibilities and processes for National Airspace Redesign in terms of project management functions and technical (airspace design) functions.

The SMP defines National Airspace Redesign as two fundamental types of airspace projects. One type focuses on optimization of the current structures; the other type addresses airspace redesign. The major differences between optimization and redesign efforts are in project scope and implementation timeframe. Optimization efforts strengthen the current system. They occur in the near term, use an evolutionary process, and concentrate on existing structures and technology. Redesign efforts are larger in scale, and develop new structures incorporating technological and conceptual enhancements, as they become available. During the course of National Airspace Redesign, the focus will shift from near term optimization of the present structures, to longer term redesign efforts.

The SMP defines a new entity, a subgroup of the Airspace Liaison Team, to create and drive redesign efforts, particularly those efforts devoted to the enroute environment. This subgroup will, on a regular basis, review all available ideas and concepts for compatibility and feasibility in light of current technology and resources. The outcome of their efforts will be a single, continually evolving vision of the national system, broken into specific tasks to produce a standardized effort.

The subgroup of the ALT is a team of individuals serving on a collateral basis. This work group, as with other National Airspace Redesign work groups, requires a major effort on the part of involved individuals, along with a corresponding level of support on the part of their parent organizations. A major commitment in time, effort, and funding, along with a collaborative approach, is necessary if the implementation of airspace redesign is to be successful. The teams must develop and maintain the expertise and vision necessary to accomplish their tasks and to ensure the outcome of an efficient national airspace system.

Lastly, the SMP establishes budget cycles, planning and prioritization mechanisms, and fiscal and project tracking systems. These processes provide the basis for establishing quality control and checks to ensure a successful effort.

1 Introduction

The national airspace is a critical and limited resource. While aircraft, navigational systems, and technology in general have advanced several generations, the structure of the airspace has not changed appreciably in the past few decades. These advances create both the need and the opportunity to revamp the airspace to better meet evolving customer requirements and to improve service provider tools. In April 1998, the FAA Administrator launched the National Airspace Redesign. Charged primarily with this key activity, the Air Traffic Airspace Management Program Office oversees the review, redesign, and restructure of the national airspace to efficiently and effectively meet the needs of diverse customers and dedicated service providers.

1.1 Background

Historically, airspace management functions have been widely dispersed. The responsibility for airspace management has resided with the regional offices, and the responsibility for operational considerations resided with air traffic control facilities. So, in the past, the focus of most airspace management has been local in scope, and centered, for the most part, on single areas of concern that are bounded geographically and subject to regional issues.

In 1982, the National Airspace System Plan called for a National Airspace Review. This became the original look at airspace for the purpose of standardizing, simplifying, and incorporating International Civil Aviation Organization (ICAO) standards.

The Air Traffic Airspace Management Program Office (ATA) was established in 1996 to provide management oversight of all ongoing and future airspace plans that would affect airspace efficiency. Following the establishment of ATA, the regional air traffic offices instituted the Airspace Management Branch (AXX-520). These regional offices provide direction and guidance to the field facilities within their region for the management and control of airspace assigned to each facility. They monitor the airspace activities as appropriate to facilitate resolutions when problems or issues occur.

Recognizing that the FAA needed to have a consensus among users and service providers, ATA requested RTCA¹ to provide a forum where representatives of government and the private sector could collaborate on concepts for airspace redesign. RTCA responded by forming Special Committee (SC) 192, National Airspace Redesign Planning and Analysis. The concepts developed by SC-192 and other government/industry forums influence the direction of current national redesign efforts.

¹ RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues. RTCA functions as a federal advisory committee. Its recommendations are used by the Federal Aviation Administration (FAA) as the basis for policy, program, and regulatory decisions and by the private sector as the basis for development, investment, and other business decisions.

Until recently, most airspace design activities were done by experienced air traffic personnel, looking at maps and manually moving boundaries/routes/fixes and empirically evaluating the effects. This largely qualitative approach has produced local, but maybe not global, solutions. The combination of local optimums does not always lead to a national optimum. Though successful in the past, this approach is becoming ineffective due to the increasing complexity of the NAS. A new, quantitatively based approach to national airspace redesign is needed.

Until the start of this national redesign effort, there has never been such a coordinated, comprehensive national airspace redesign effort. With the evolution of operations and modernization of supporting systems, there is a need to develop a consistent, cohesive approach for airspace redesign, that, when implemented, will meet a set of well-articulated local and national objectives.

1.2 Purpose

The National Airspace Redesign Strategic Management Plan establishes the process, structure, and responsibilities for developing, managing and implementing the National Airspace Redesign. It serves as a single document to provide a definition of the program, list broad goals and objectives, and define mechanisms to be used to achieve those ends. Additionally, it outlines the relationships between FAA National Airspace Redesign and other NAS modernization programs.

1.3 Intended Use

The National Airspace Redesign Strategic Management Plan serves as:

- The guide for individuals and teams working on National Airspace Redesign efforts
- An essential reference source for individuals and teams working on other NAS modernization programs or concepts
- The basis for defining National Airspace Redesign requirements, including the development of funding proposals

1.4 Assumptions and Constraints

1.4.1 Assumptions

Fundamental assumptions about future events and conditions are inherent in developing any form of strategic plan. Airspace redesign is no different. The need for airspace redesign and the form of the redesigned airspace is based on the following assumptions.

System Efficiency

The most fundamental assumption underlying this document is that there is, within the NAS, a capability for more efficient airspace utilization. The future airspace will be designed to address controller and pilot workload issues while accommodating users in a variety of vehicle forms to operate safely and efficiently.

Technology

We assume anticipated improvements in communications, navigation, and surveillance will allow for increased user access and system flexibility. Future developments in decision-support tools will assist controllers in accommodating future system demands.

Equipage

As improved technology becomes available, airspace users will choose to equip with technology that affords them a significant cost-benefit advantage. Most high performance aircraft are currently equipped with sophisticated area navigation and flight management computers that enable them to fly more precise routes. This equipment will migrate to Department of Defense (DoD) aircraft and the majority of general aviation aircraft. Most airspace users will be able to navigate without the aid of ground-based navigation aids.

Collaboration

The continuing collaboration between FAA management and unions will continue with good faith bargaining by all parties. Issues such as compensation, staffing, human factors, and workload will be resolved prior to recommended airspace improvements being implemented. The FAA will also continue to share ideas with airspace users and public interest groups and listen to their concerns.

Infrastructure Enhancements

The evolution of the NAS infrastructure and redesign of the national airspace are closely interdependent, and will be accomplished through incremental system improvements. In order to implement the concepts and to achieve outcomes expected as part of the redesign, key enhancements to existing capabilities in the NAS must be made. Design alternatives will be developed assuming that enhancements to the NAS infrastructure will proceed at a pace to meet the demands of National Airspace Redesign.

1.4.2 Constraints

Funding

National Airspace Redesign can only occur if there is a steady, dependable stream of funding appropriated for this purpose.

Environmental

The National Airspace Redesign recognizes that environmental constraints could limit optimal airspace design.

Requirements Definition

New forms of airspace users will be sharing the same, finite airspace with the current mix of aviation users. The airspace requirements for many of these new users are yet to be defined. Thus airspace improvements that incorporate these vehicles are constrained until users and regulators agree on performance, equipage, and separation parameters.

2 Definition of National Airspace Redesign

The purpose of the National Airspace Redesign is to review domestic and oceanic airspace and develop a strategy that will allow Air Traffic to make changes that will achieve the most efficient airspace design for customer operations while maintaining the highest standards of safety.²

The National Airspace Redesign is the means through which the Air Traffic Airspace Management Program Office manages the optimization and modernization of airspace to achieve the desired outcomes as specified in the Air Traffic Services Performance Plan:

- Maintain system safety
- Decrease system delay
- Increase system flexibility
- Increase system predictability
- Increase user access

National Airspace Redesign is a major undertaking that involves many FAA organizations and programs as well as external stakeholders. The cooperation and support of all is essential to the success of National Airspace Redesign.

2.1 Goals

Airspace management and design teams use the following overriding performance goals to guide their work in National Airspace Redesign:

2.1.1 Maintain System Safety

ATS's primary responsibility is for the day-to-day safe operation of the airspace system. All other considerations are secondary. To ensure system safety, National Airspace Redesign takes a cautious and incremental approach to airspace changes. Every change must consider the concerns of all stakeholders. The airspace changes must also use acceptable human factors engineering principles.

Airspace designers and managers must use design principles aimed at increasing efficiency by reducing complexity. Airspace improvements incorporating this concept help to reduce both operational errors and deviations.

Should the development of new concepts or technologies provide the opportunity to enhance system safety, these opportunities will be pursued.

² National Airspace Management Plan, Section 1.4

2.1.2 Decrease System Delay

Proposed redesigns of airspace should be evaluated in terms of the effects of potential delays encountered by system users.

2.1.3 Increase System Flexibility

Airspace teams employ designs and procedural enhancements that respond to changing conditions enabling users and service providers to adapt their operations for greater system efficiency.

2.1.4 Increase System Predictability

Predictability is a measure of the variation in the air traffic management system as experienced by the user. This variability is a result of the inherent uncertainty that accompanies the operation of the complex aviation system. More efficient airspace design results in traffic flows that are more consistent and predictable.

2.1.5 Increase User Access

In the context of airspace planning, increasing user access means reducing or minimizing airspace restrictions and improving access to airspace and airports.

2.2 Scope of National Airspace Redesign

National Airspace Redesign encompasses optimization of the current airspace system as well as design and implementation of airspace based on new technology and concepts to increase efficiency. Funding will be at a level to accomplish this task. However, funding is not provided by National Airspace Redesign to support infrastructure requirements peripheral to airspace optimization/design, even in those instances where airspace redesign created the requirement. Those items will continue to be financed using the appropriate budget process.

Environmental assessments are the responsibility of the proponent of the change under consideration. Thus, National Airspace Redesign would be responsible for funding environmental work associated with a change in traffic flow resulting from an airspace enhancement, but not for environmental work for a change in traffic flow as a result of airport modifications. As an example, environmental work associated with construction of a new runway should be defined in such a manner to encompass the airspace/procedural modifications resulting from the construction. There may be instances where National Airspace Redesign will fund these efforts because environmental work, already completed, was not sufficient. These instances will be handled on an individual basis.

2.3 Terminal and Enroute Optimization

Terminal optimization efforts are ongoing initiatives to ensure the airspace design and use is effective for transitioning aircraft to and from the associated airport. This continual improvement process is necessary to ensure that changes in user requirements and capabilities are accommodated in a timely manner, and to ensure NAS modernization efforts produce increased efficiency³. Terminal optimization efforts are normally initiated and managed at the local level, by the terminal facility and associated ARTCC(s). National involvement is limited, consisting of review to ensure the resulting structure integrates efficiently into the national airspace design.

Enroute optimization efforts are also ongoing initiatives to ensure present airspace design and utilization is effective in moving aircraft from the departure terminal area to the arrival area. Enroute optimization is an incremental process, which, although expected to increasingly conform with enroute redesign plans, is not dependent on these initiatives. Enroute optimization efforts range in scope from local issues within an ARTCC, to analysis and modification of major national traffic flows. Management of these projects should be commensurate with the scope of the effort. Initiatives involving multiple regions may require development of a national level management structure.

2.4 Terminal and Enroute Redesign

Terminal redesign is a major undertaking to develop a structure that takes full advantage of new equipment, aircraft capabilities, and enroute modernization (redesign). As envisioned, it will normally be developed to provide flexibility for system users to efficiently transition into and out of terminal airspace while making maximum use of airspace and airport capacity. Additionally, terminal airspace may be redesigned to accommodate efficiencies achieved as a result of enroute redesign efforts.

Enroute redesign is a major undertaking to develop an enroute structure that takes full advantage of the NAS and aircraft equipment capabilities resulting from modernization efforts. As envisioned, it normally will be developed as a top down approach, creating a system incorporating new technologies and maximizing flexibility for system users. However, enroute redesign can also be driven by terminal redesign initiatives

There are an increasing number of airspace utilization concepts, which have been, or are being developed, to meet the objectives of national airspace redesign. Enroute redesign efforts will result in reviewing, assessing and merging these concepts along with other innovations to define short, medium and long-term actions resulting in incrementally instituting a modernized enroute system. Enroute redesign requires a national management structure.

³ Efficiency, in this instance, has dual meanings. 1. In the context of a service provider, efficiency refers to improvements in controller workstations, displays, tools, and procedures. 2. In the context of an airspace user, efficiency refers to the ability to select and fly, as close as possible, their optimum routes, altitudes, and times.

2.5 Relationship to Other Organizations, Programs, and Concepts

National Airspace Redesign leaders must create a relationship with other groups that require airspace modification or change. There are several organizations, programs, and concepts within the Federal Aviation Administration that could affect the airspace in the NAS. These programs and concepts should be cataloged to ensure effective redesign at a corporate level, reducing redundancies and unrealistic goals of end state redesign.

2.5.1 Free Flight

Free Flight has been established as the key concept for the evolution of the national airspace system. The incremental implementation of free flight has been outlined in a consensus operational concept and action plan, and is reflected in the FAA's NAS Architecture. The Government/Industry Free Flight Action Plan lays out the initiatives needed to address the recommendations on procedural and operational changes, and technology and modernization systems needed to deliver the capabilities identified in the evolving Free Flight concept. Airspace enhancements form a major component in the implementation of the free flight concept and architecture.

2.5.2 Relationship to Other Programs

Established programs represent FAA policy decisions to move forward with enhancements in architecture or procedures based primarily on technological improvements. National Airspace Redesign is such a program, and works in unison with other programs to accomplish the policy goals established in strategic service plans. To accomplish this synchronization, the Air Traffic Airspace Management Program Office represents National Airspace Redesign to other program entities, and coordinates plans to produce common progress toward these goals. National Airspace Redesign goals and time frames may be adjusted based on this synchronization, and conversely, other program goals and time frames may be adjusted due to National Airspace Redesign plans.

All participants of the National Airspace Redesign are responsible for being aware of these other programs and the efforts to coordinate with these other programs. They must ensure this information is used effectively when planning and implementing the National Airspace Redesign.

2.6 Relationship of the Plan to Other Documents

2.6.1 Strategic Service Plans

Strategic Service Plans provide airspace planners and designers with a vision of NAS operations in future time periods. They focus on concepts that anticipate user requirements, propose future architecture, suggest procedural changes, and forecast other aspects of the

future NAS. Using these documents provides further background useful in designing airspace for that time frame.

Examples of these documents include the FAA Strategic Plan, The Air Traffic Service Performance Plan, and the Air Traffic Service Plan. These documents assess customer needs, establish services to be provided, and establish future directions to be undertaken to provide those services. Along with other modernization efforts, the National Airspace Redesign supports the operational objectives of safety and efficiency.

2.6.2 Airspace Redesign Documents

Information and guidance for airspace redesign comes from three primary sources: joint government and industry documents published under the auspices of the RTCA; documents produced by the Air Traffic Airspace Management Program Office (ATA); and from other related FAA documents. RTCA documents represent the consensus of aviation users and service providers on the application of pertinent technology or proposed solutions to system technical issues. The recommendations in RTCA documents are often used as the basis for government and private sector decisions as well as the foundation for many FAA Technical Standard Orders. FAA-ATA publications provide guidelines for all aspects of airspace design. From overarching airspace management plans to standardized checklists for airspace design projects, FAA-ATA documents are fundamental resources for airspace managers, planners, and designers. Other FAA airspace related documents offer background materials (e.g., predicted enhancements or growth rates) that are necessary in formulating new airspace solutions.

These documents establish the framework for developing and implementing airspace redesign in a manner consistent with policy established in NAS Operational Documents, and provide tools, data, and procedures for accomplishing the task.

2.6.3 Program Documents

Program documents include publications dealing with FAA acquisition and development programs. These programs include both new technologies and contemplated procedural. The application of each technology or procedural enhancement may affect the manner in which airspace is used. Likewise, changes to the current airspace structure may need to be incorporated into the concepts of operations of some program documents.

These documents, along with airspace redesign documents, are developed to support policy established in the Strategic Service Plans. They define programs that must work in conjunction with the National Airspace Redesign efforts to jointly accomplish these policies. This may require modification of National Airspace Redesign plans to meet other program goals or capabilities; or conversely, other program goals and/or capabilities may need to be adjusted to meet National Airspace Redesign goals and objectives.

2.6.4 Airspace Concept Documents

Airspace designers have developed concepts of operation employing new forms of airspace management and design. These concepts include dynamic sectorization, user-preferred trajectory routings, increased ultra high sectors, advanced global navigation capabilities, and other concepts that require airspace interaction for effective deployment. The concepts described in these documents influence, and are influenced by, National Airspace Redesign. A major function of National Airspace Redesign is to address these concepts in a practical and coordinated fashion. Innovations are progressively incorporated into the system in a planned, orderly manner as technology, training, funding, and user capabilities permit. To achieve this, the National Airspace Redesign planning function must:

- Review and assess available concepts.
- Determine what can and should be done, and when.
- Establish the desired direction (develop goals).
- Define short and long term objectives (tasks).
- Review, refine, and repeat the process.

2.6.5 Other Airspace Related Documents

Government, industry, academia, and the media publish the results of a variety of forms of aviation research. Frequently, an article or a publication on one aspect of aviation will highlight the effects of that research on airspace. Airspace planners and managers should be alert for the explicit and implicit consequences for airspace in almost any form of aviation related document.

2.7 Phased Implementation of National Airspace Redesign

2.7.1 Near-Term Phase

The near-term time frame for the implementation and impact of the National Airspace Redesign will reflect the completion time frame of the Free Flight Phase-1 core capabilities. Airspace activities will focus on current congested areas, but will emphasize problem definition and alternative development. Design alternatives will be explored to employ evolving user capabilities, capitalize on FFP1 tools and current aircraft capabilities, and alleviate sector-loading issues.

Implementation of changes during this time frame will focus on optimizing, or fine-tuning, the existing airspace structures. Near-term redesign efforts will focus on those that could provide the most benefit in the fastest time. These changes to sectors, routes, and traffic flows should not require major infrastructure modifications and will be based on today's technology. However, specific infrastructure, facility, and other resource constraints may impact airspace optimization activities within this time frame. Similarly, as near-term redesign efforts progress, additional infrastructure needs may be identified. To address these constraints and needs, the

National Airspace Redesign will generate necessary planning information to influence and impact NAS modernization and sustainment programs.

During the near-term, the redesign will also introduce applications of evolving technologies to increase exposure to these systems for both pilots and controllers. For example, minor airspace modifications will facilitate advanced navigation procedures and overlays in the terminal and enroute domains. This experience will be used to support the use of new procedures and airspace management concepts enabled by these technologies.

The Near-Term Phase will also provide the opportunity to develop several support mechanisms to the overall activities of National Airspace Redesign. Policy, procedures, tools and organizations necessary for National Airspace Redesign efforts will be established. This includes development of the National Airspace Management Plan and Handbooks, establishing the ATA Lab and field level modeling tools, creation of Program Management and Technical Teams, and data collection/analysis to support future efforts.

Research and analysis thrusts during the Near-Term Phase will include exploration of airspace and sector designs dealing with stratification, traffic type specialization, and lateral boundaries. A top-down approach to developing a flexible, predictable enroute structure based on point-to-point trajectories will be explored. These new structures will be planned and developed during the Near-Term Phase, but implementation is not expected until later phases. Results of this modeling and analysis will drive decisions on applicability and implementation of these concepts.

2.7.2 Mid-Term Phase (2003-2008)

Completion of the near-term initiatives provides the foundation for the mid-term efforts. In the Mid-Term Phase, the capabilities of new technologies are examined, weighed, and implemented within the overall architecture of the National Airspace Redesign. Beginning with the Mid-Term Phase, the redesign plan follows a more rigorous structure for leveraging advanced technologies and procedural changes. In this time frame, technological improvements in communications, navigation, surveillance, and automation, will allow for more flexibility in airspace design initiatives. Using the initial knowledge, experience, and operational acceptance developed during the Near-Term Phase, implementation of airspace structures and procedures based on new technologies will be expanded outside the initial test beds.

During the Mid-Term Phase, National Airspace Redesign transitions from establishing the infrastructures necessary to conduct the National Airspace Redesign and optimizing the existing airspace structure, to concentrating on design and implementation of new airspace structures based on modern technology and concepts. Although the current airspace design based on airways and other service provider designed routes will still be available, implementation of a structure designed to support point-to-point navigation will increasingly be relied on.

The diversity of the types of airspace users and variety in performance capabilities of aircraft will increase in the mid-term. As an example, the number of commercial space launch facilities and launches will increase. Requirements for inclusion of other types of aircraft should

be completed in the Mid-Term Phase and should address how the evolving form of airspace users will be accommodated in the NAS. Airspace design alternatives that will be developed in the mid-term will reflect these policy decisions.

Research emphasis for the Mid-Term Phase will focus on human-centered simulation and analysis to determine feasibility and impact of advanced concepts developed during the Near-Term Phase. Results of research and analysis efforts concerning advanced concepts for airspace and sector design should provide the needed information to support implementation-planning decisions to be made in the Mid-Term Phase.

2.7.3 Long-Term Phase (2008 and beyond)

Examination of the plans for long-term initiatives in airspace redesign is more difficult because the availability of possible technological enhancements has not yet been established by the agency. At the minimum, it can be expected for the Long-Term Phase; to continue incremental improvements reflective of available technology. In general, the enroute domain will be engineered to permit the use of Free Flight functionalities – optimized trajectories, strategic and tactical conflict detection and resolution, and time-based collaborative metering. In the terminal area, significant performance enhancements and efficiencies will be obtained by reducing traffic complexities and by using optimized trajectories. With the increasing use of ATC decision support tools, systemic variations will be reduced and operations can be planned more accurately.

3 Structure and Management of National Airspace Redesign

3.1 Functions

The structure and management of the National Airspace Redesign are supported by two main functions, Program Management and Technical.

The Program Management Functions are:

- Resource procurement, allocation, and tracking
- Problem identification and prioritization
- National Airspace Redesign Planning Function (see 1.5.4)
 - ◆ Review and assess available concepts
 - ◆ Determine what can and should be done, and when
 - ◆ Establish the desired direction (develop goals)
 - ◆ Define short and long term objectives (tasks)
 - ◆ Review, refine, and repeat the process.
- Forming, tasking and monitoring technical teams

Most technical functions are performed by National Airspace Redesign work groups. Technical functions include:

- Design airspace and procedures to accomplish National Airspace Redesign goals and objectives
- Assess concepts and initiatives for operational use and effectiveness

3.2 Roles and Responsibilities

Organizational roles and responsibilities for overall airspace management are defined in Section 2 of the National Airspace Management Plan (NAMP). The National Airspace Redesign is a program initiated and managed by the Airspace Management Program Office (ATA) to accomplish certain responsibilities pertaining to airspace management. As such, roles and responsibilities for the National Airspace Redesign should align with those responsibilities as specified in Section 2 of the NAMP.

To effectively implement National Airspace redesign, it is necessary to establish teams to perform program management functions, and teams to perform technical airspace design functions.

Airspace must be designed to be workable for all facilities and users involved. Facilities and regions must work with each other to develop global solutions. Compromise, when necessary, should yield a product that benefits the overall system.

3.2.1 ATA Responsibilities

The Air Traffic Airspace Management Program Office (ATA):

- Manages the National Airspace Redesign budget submission through allocation
- Develops national policy for National Airspace Redesign
- Develops, maintains and schedules tools (Lab)
- Tracks projects
- Chairs the ALT
- Liaisons with other Programs (strategy service goals)

3.2.2 ATA-200 Responsibilities

In support of the National Airspace Redesign, the Airspace Planning and Analysis Division (ATA-200) has responsibility for five functional areas: oversight and procedures, field support, modeling and simulation tools, analysis, and data delivery operations.

Oversight and Procedures

- Provide program management support to the National Airspace Redesign ensuring efforts are integrated to meet policy, goals, and objectives.
- Develop and maintain standards and guidelines for the National Airspace Redesign.
- Provide guidance to other FAA offices, and to the aviation community, on rules and procedures for airspace design, development, and change.
- Maintain cognizance of and connectivity with other NAS modernization programs for the National Airspace Redesign.
- Coordinate with appropriate headquarters and regional offices to ensure environmental issues are addressed

Field Support

- Provide technical support to regional air traffic divisions and facilities in planning and analyzing regional or local proposed changes.
- Provide support for validated requirements.
- Coordinate projects that will affect airspace structure and sector design, modification, and development activities among regions and field facilities.
- Develop, monitor, track, and maintain the National Airspace Redesign so that the field units have an understanding of the national consequences of their work.

Modeling and Simulation Capabilities

- Review, evaluate and recommend airspace modeling and simulation tools applicable to proposed airspace changes.
- Provide oversight on the selection, use, and provisioning for models that support analysis and simulation of airspace redesign plans.
- Ensure that the use and application of modeling and simulation tools are appropriate to airspace development activities and are able to meet requirements.

Analysis

- Conduct analyses of the airspace system efficiencies when major issues arise, when requested by senior level managers, or when part of modeling activities of which ATA is an active partner.
- Conduct analyses of evolving airspace design concepts.
- Manage and oversee airspace modeling and simulation activities.
- Manage and maintain airspace performance metrics.

Data Delivery Operations

- Manage, update, and maintain the inventory of data to support airspace modeling and simulation capabilities.

3.2.3 National Airspace Redesign Work Groups

Work groups established under National Airspace Redesign must accomplish both program management and technical (airspace design) functions as specified below.

Airspace Liaison Team (ALT)

The Airspace Liaison Team (ALT) was created to provide the forum within which the FAA develops consensus regarding airspace management issues and activities. The major program management functions of the ALT are to:

- Review proposed National Airspace Redesign projects
- Prioritize regional and national redesign projects
- Recommend policy and funding allocations to ATA

One of the major roles of the ALT is to review the proposed redesigns of the airspace structure that have national implications. This group strives to do this by establishing unity with interested parties, providing a forum for communicating concerns, and using the power of combined experience to derive workable solutions regarding the national airspace.

The ALT is chaired by ATA and has representatives from the regions, FAA HQ offices, and other supporting entities. The decision making body of the ALT (Core ALT) is composed of a management and a union member from each of the nine FAA regions and ATA. ATA-

200, the ATCSCC, SUPCOM, MITRE-CAASD, and the ATA Laboratory are also members of the ALT (ALT Support) providing subject area expertise and coordination, but do not have decision-making responsibilities. The ALT also relies on input from several FAA headquarters offices. These coordinating offices include Office of System Capacity, Flight Standards, Air Traffic Procedures and Planning, Airspace Environmental Programs Division, Airspace and Rules Division, System Development, and the Office of Commercial Space.

The ALT has a role in expanding the perspectives of all its participants and aiding design teams. Although the ALT does not serve a resolution function, it will attempt to mitigate conflicts and facilitate communication prior to impasse. Unresolved conflicts will be addressed using traditional methods.

To support its program management functions, the ALT establishes and maintains a technical subgroup focused on national design. This subgroup, the SALT, is described in the following section.

ALT Subgroup

A subgroup of the ALT (SALT), consisting of both management and union representatives, is formed to provide a source of national expertise and knowledge capable of reviewing proposals that will affect the airspace beyond the regional boundaries. Their recommendations are presented to the ALT for final determination.

ATA-1 and the National NATCA Liaison determine membership to the SALT. SALT members represent geographic diversity and possess a broad knowledge of systems and programs. Members are innovators, leaders, and communicators within the airspace design community.

The ALT tasks the SALT. Formal requests for analysis or recommendations from external entities are presented to the ALT for consideration.

The primary focus of the SALT is national redesign. The members of the SALT must be familiar with the capabilities and requirements of each tool available for airspace design and planning. In addition, they understand how changes in U.S. airspace can affect global aviation.

The SALT is responsible for obtaining information from external groups that will help it in its function. However, the SALT has no ability to make commitments or agreements with these external entities.

To accomplish assigned tasks, the SALT will:

- Review and assess available concepts. The various conceptual ideas, along with internally generated innovations, must be merged into a singular, evolving airspace vision (the vision will evolve as additional concepts and ideas are explored). This includes resolving inherent conflicts between the various concepts, and producing a plan that compliments other programs and modernization efforts to achieve the outcomes specified in the NAS Service Plans.

- Determine what can and should be done, and when. The airspace utilization vision must be measured against the current airspace system, taking into consideration the status of NAS modernization efforts, user capabilities, and potential constraints, to propose implementation goals.
- Define short and long term objectives.
- Present the above as recommendations to the ALT.
- Continuously review the evolving airspace vision.

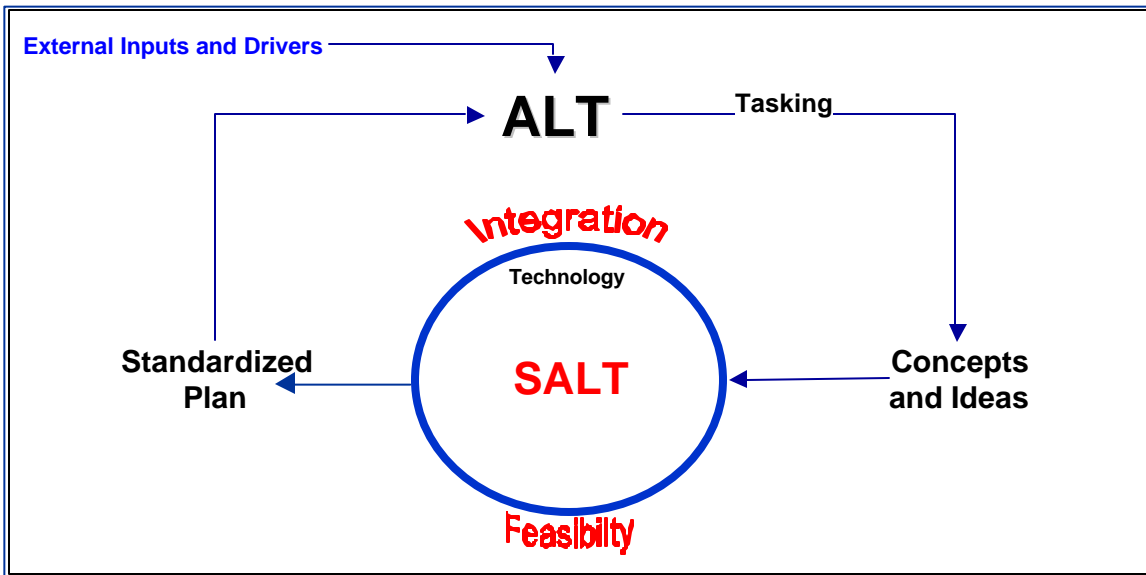


Figure 1 The Relationship of the SALT to the ALT

Regional Focus Leadership Teams (RoFLT)

In the spirit of collaboration, each regional airspace branch has formed a relationship between management and union to facilitate and promote airspace improvements. Each Focus Leadership Team (FLT) works with regional airspace design teams to develop airspace solutions. The regional FLT also coordinates airspace initiatives occurring at the facility level within its region by coordinating activities among the facility FLTs. The regional FLTs are members of the ALT and participate in decisions affecting national airspace issues and redesign. The regional FLTs attempt to mitigate conflicts and facilitate communication prior to impasse.

Facility Focus Leadership Teams (FacFLT)

Each ARTCC and some TRACONs have formed their own management/union FLT to work with facility airspace designers and solve airspace issues under the purview of that facility. Their functions and duties are similar to that of the regional FLTs.

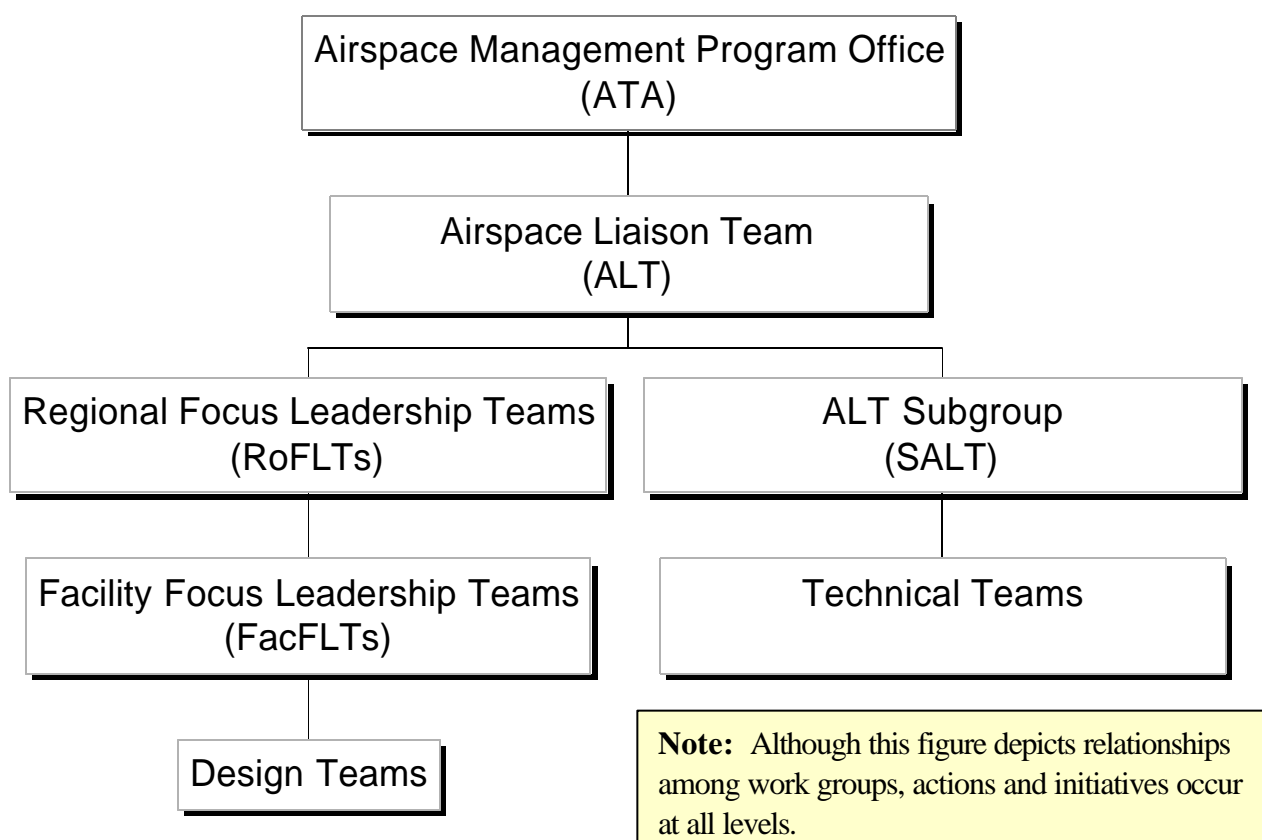
Facility Design Teams

Facility Design Team members are experienced controllers and airspace designers skilled in using airspace models for analyzing airspace changes. The design teams are formed in facilities around the country. The members of these teams are experts in their local operational area and know the timing and reason for each flow. They understand the requirements of the local user community and what makes that section of the NAS unique. Their tasks are to design and evaluate changes to their airspace and associated procedures.

Figure 2 National Airspace Redesign Work Groups and Functions

	Program Mgmt Functions	Technical Functions
ATA	Funding policy, modeling, ALT Chair, resources, tracking	Cross-program relationships
ALT	Prioritization, project approval, allocation of funding Implementation planning	
SALT		National requirements, planning, design
RoFLT	Regional funding & resources Regional timeliness, status	
FacFLT	Facility funding & resources Facility timeliness, status	
Design Team		Local design Cross regional facility design

Figure 3 National Airspace Redesign Work Group Relationships



3.3 Collaboration

Since National Airspace Redesign affects many different stakeholders, there are deliberate and comprehensive efforts made to develop consensus through collaboration. Internal collaboration has already been established with the formation of the ALT and the FLTs which provide management and union input to the redesign process. Efforts to foster collaboration between airspace users and airspace service providers continue through venues that include RTCA Special Committee 192. Moreover, FAA representatives are regularly meeting with concerned citizens, representatives of state and local government, and representatives of special interest groups to encourage collaboration on common issues.

3.3.1 Management and Union

Both FAA management and NATCA are committed to National Airspace Redesign. Collaboration between management and union is fundamental to implementing changes aimed at enhancing the safety and efficiency of air traffic movements within the NAS. Collaboration facilitates the free movement of new and creative ideas that lead to the most effective improvements. Improvements that are the result of a collaborative effort can be more easily implemented.

3.3.2 Users and Service Providers

Service providers who function as airspace planners and designers understand that each change they implement will have some economic effect on the airspace users. Changes affecting routes and altitudes impact users' fuel requirements and flight time. Users are invited to collaborate with service providers in the development of changes that will affect their operations. This input will facilitate the acceptance of subsequent redesign, and encourage users to invest in new equipment that make airspace improvements possible.

3.3.3 FAA and Community Groups

Since changes to air traffic patterns may lead to changes that require environmental review, airspace planners should work with the public to mitigate community concerns. Failure to collaborate with public interest groups and local government representatives may lead to costly delays and possible cancellation of proposed changes.

3.4 Budget and Management Cycle

ATA manages funding authorized for National Airspace Redesign based on appropriation language, and established priorities. Funding must be allocated to accomplish the following:

- Comply with designated funds
- Meet short term system optimization requirements

- Plan and initiate long term redesign efforts.

The following process is used by ATA to establish priorities and manage funds:

- ATA establishes a date for the submission of budget requests for the following fiscal year.
- A collaborative approach is used to establish priorities for non-designated funds. An ALT meeting is scheduled after budget submission to set priorities for the following fiscal year, and for end-of-year spending.
- ATA schedules an ALT meeting following distribution of funds at the beginning of each fiscal year.
- Additional ALT meetings are scheduled as necessary to review spending plans and expenditures.

4 Documentation and Tracking

4.1 Project Tracking

ATA-200 maintains an overall timeline and status tracking of each National Airspace Redesign project. All work groups and teams established under National Airspace Redesign maintain and submit ongoing status reports on each project to the regional airspace branch. Each regional airspace branch compiles and submits status reports to ATA-200 at the frequency and level of detail deemed necessary to maintain this tracking system. The SALT submits the required data on their projects directly to ATA-200.

4.2 Tracking of Funds

It is essential that funds allocated to National Airspace Redesign be properly accounted for. ATA-200 is the focal point for this effort, and as such requires detailed reports from the regional airspace branches on a monthly basis. This report, using the designated form, shall provide a detailed listing of all funds expended or authorized. Additionally, ATA-200 provides the airspace branches with the monthly DAFIS accounting report. This report shall be reconciled with the airspace branches' tracking system to ensure accuracy.

5 Evaluation Process

Until recently, most airspace design activities were done by hand with very knowledgeable air traffic personnel, looking at maps and manually moving boundaries/routes/fixes and empirically evaluating the impacts. With the evolution of computer-based tools, more sophisticated capabilities are available to support the redesign process. These tools have varying detail and fidelity, and require varying resources (time, computing power, data preparation, and data post-analysis). These tools are being used to identify national and regional solutions. To support the effective use of these tools, ATA has developed, and the ALT has adopted, two key standards documents. The *Airspace Management Handbook - Guidelines* and the *Airspace Management Handbook - Metrics* outline the key process and metrics to be used in evaluating the National Airspace Redesign.

List of Acronyms

ALT	Airspace Liaison Team
ARTCC	Air Route Traffic Control Center
ATA	The Air Traffic Airspace Management Program Office
ATA-200	The ATA Airspace Planning and Analysis Division
ATS	Air Traffic Services
DAFIS	Departmental Accounting and Financing Information System
DoD	Department of Defense
FAA	Federal Aviation Administration
FacFLT	Facility Focus Leadership Team
FFP1	Free Flight Phase-1
FLT	Focus Leadership Team
NAS	National Airspace System
NATCA	National Air Traffic Controllers Association
RoFLT	Regional Focus Leadership Team
RTCA	RTCA, Inc.
SALT	Subgroup of the Airspace Liaison Team
SC	Special Committee
SUA	Special Use Airspace

Bibliography

Strategic Service Plans

- *ATS Concept of Operations for the National Airspace System in 2005* (September 1997)
- *Blueprint for NAS Modernization* (January 1999)
- *Air Traffic Service Plan 1998 - 2003* (May 1999)
- *National Airspace System Architecture* (version 4.0)
- *Air Traffic Environmental Strategy for the NAS*
- *Aviation Capacity Enhancement Plan* (ACE)

Airspace Redesign Documents

RTCA Documents

- *Government/Industry Guidelines and Concepts for National Airspace Analysis and Redesign* (RTCA: June 1998)

ATA Documents

- *National Airspace Management Plan* (July 1997)
- *Airspace Management Handbook* (Guidelines, Checklist & Metrics)

Airspace Concept Documents

- *High Altitude Airspace Design Structures* (MITRE/CAASD: Sept 1999)
- *National Airspace Redesign Air Traffic Position Paper for Dynamic Resectorization* (FAA-ATA)
- *Adaptive Airspace Management: Current Field Applications and Recommended Next Steps* (MITRE/CAASD: Sept 1998)
- *Near Term Operational Concepts for Adaptive Management of Special Use Airspace* (MITRE/CAASD: Sept. 1998)

Other Airspace Related Documents

- *The Impacts of Regional Jets on Congestion in the NAS* (MITRE/CAASD: Nov. 1998)
- *The Influence of Separation Minima on National Airspace System Capacity* (FAA: July 1999)